hemoglobin fixes carbon monoxide and in all probability a relatively large part of aerial CO is disposed of in this way. The hemoglobin binding CO is destroyed in the liver, the CO probably remaining attached to the protein end of the globin, and not to the biliary and urinary pigment which result from the decomposition of hemoglobin. The globin is excreted as urea, ammonia, etc., while some may be retained as amino-acid, but doubtless the CO globin is treated as foreign material and excreted. Another method of disposal of aerial carbon monoxide is the union in sunlight, with the halogens, bromine, iodine, etc., of our atmosphere and with the fluorine freed in the mountainous districts during storms involving lightning. In such cases, the carbon monoxide is converted to a carbonyl halide or to CO_2, in either case being capable of utilization by bacteria, plants with chlorophyll, etc.

The above communication was written previously to the publication of Lamb, Bray and Frazer's contribution from The Chemical Warfare Service entitled "The removal of carbon monoxide from the air" in the J. Ind. and Engineering Chemistry, March 1920, Vol. 12, p. 213. W. M.

THE ATTAINMENT OF HIGH LEVELS IN THE ATMOSPHERE

To the Editor of Science: In the April 9, 1920, issue of Science, Dr. J. G. Coffin, on behalf of the Curtiss Aeronautical and Motor Corporation, questions the record of Major Schroeder, namely 36,020 feet, given in my brief review of high level records, in Science, March 19, 1920.

So far as I can now ascertain, Dr. Coffin is justified in questioning this particular record. The director of the Bureau of Standards informs me that the bureau has not yet determined the true altitude and that when determined it will be for the Air Service to make proper announcement. With such imperfect data, as I can now obtain, the approximate values are: Rohlfs, 9880.5 meters (32,418 feet); Schroeder, 9505.0 meters (31,184 feet). These are the elevations corrected for mean air column temperature, vapor pressure, gravity, altitude and latitude. The main reduction factor is of course the temperature. These results, however, must not be accepted as final. Until final and authentic data are forthcoming, the justice of Dr. Coffin's criticism must be admitted. The words "The record now stands—Schroeder, February 27, 1920, 10,979 meters" in Science, No. 1316, p. 288, should be accepted with reservation.

Let us hope, however, that before the end of summer both of these plucky aviators will have attained a true height of 10,000 meters.

Alexander McAdie
Blue Hill Observatory,
April 22

SCIENTIFIC BOOKS

Introduction to General Chemistry. By Herbert N. McCoy and Ethel M. Terry. Chicago, Ill., 1919. Pp. viii + 605.

The subject matter covered in the course in chemistry given to the freshmen class at the University of Chicago is the basis for this text-book. It does not aim to include all the material usually considered in a course in descriptive inorganic chemistry; the facts of the science are used primarily to illustrate fundamental principles and laws. A brief statement of the order in which the material is treated will bring out the point of view of the authors. The first chapter deals with the measurement of gases. In the next four chapters the fundamental concepts of the science are developed; these include indestructibility of matter, a pure substance, an element, analysis of substances, law of definite composition derivation of formulæ. Acids, bases, and salts, water and solutions, the kinetic theory and the atomic hypothesis are next considered. A chapter on chlorine and its compounds with hydrogen and metals is followed by a consideration of chemical equilibrium, oxidation and reduction, heat and energy. Three chapters are devoted to the ionic hypothesis and one to electro-chemistry. Nitrogen, phosphorus, sulphur and carbon and their simple compounds are then described. A rather long chapter on organic chemistry in which structural formulæ are

freely used follows. Attention is next turned to the theory of dilute solutions, disperse systems, some additional elements, the periodic classification, and radio-activity.

In the discussion of the topics noted many chemical facts are brought before the student but stress is laid on principles and little space devoted to facts of general interest unless they serve as examples of these principles. For example, the only reference to the preparation of iron from its ores is a paragraph on carbon as a reducing agent, in which the statement is made that metallic iron is made from the mineral hematite by reduction with coke at white heat.

The book is clearly written. It will be of interest to teachers to see how rather difficult subjects can be handled effectively in a simple manner. It will be looked upon with favor as a text for beginners by those who desire to teach facts only through the use of laws and theories and do not think it advisable to unduly emphasize the applications of the science.

JAMES F. NORRIS

NOTES ON METEOROLOGY AND CLIMATOLOGY

RAINFALL INTERCEPTION BY TREES AND CROPS

FOR several years Mr. Robert E. Horton, consulting hydraulic engineer, Voorheesville, N. Y., has carried on investigations of the various aspects of rainfall in relation to run-off.[1] In such studies what the hydraulic engineer needs to know first is how much rainfall reaches the ground, over a watershed. Is it the amount of precipitation that as shown by well-exposed gages?[2] No. Much rain and snow is intercepted by trees, and evaporated. Thus the hydraulic engineer, unlike the meteorologist, needs to study the catches of rain-gages under trees as well as in the open. [Some cooperative observers seem to have anticipated this need.] Mr. Horton has made a careful study of the amount of precipitation which falls through different kinds of trees and of that portion of the intercepted rainfall which runs down the trunks. Also, in order to enable him to form an estimate of the water which reaches the ground over a varied watershed he has determined the amount of rainfall intercepted by different growing crops in various stages. The results of his investigations have been published in the *Monthly Weather Review*.[3]

Mr. Horton concludes that

> Rainfall interception represents a loss of precipitation which would otherwise be available to the soil. The loss takes place through evaporative processes, but may, for convenience be subdivided into (*a*) interception storage, and (*b*) evaporation during rain.
>
> The amount of interception loss is primarily a function of the storage capacity of the plant surface, the duration of precipitation, and the evaporation rate during precipitation. Since there is generally a fairly close correlation between shower duration and amount of precipitation, estimates of interception loss can, for practical purposes, be expressed in terms of precipitation amount per shower.
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> The interception storage loss for trees varies from 0.02 to 0.07 inch per shower, and approaches these values for well-developed crops. . . . The . . . loss is greater in light than in heavy showers, ranging from nearly 100 per cent. where the total rainfall does not exceed the interception storage capacity to about 25 per cent. as an average constant rate for most trees in heavy rains of long duration. [Of this] the amount of water reaching the ground by running down the trunks of trees . . . is . . . commonly 1 to 5 per cent. of the total precipitation. The percentage increases from zero in light showers to a maximum constant percentage in heavy showers of long duration. Light showers are much more frequent than heavy ones, and the interception loss for a given precipitation in a month or season varies largely according to the rainfall distribution.

[1] See "Additional Meteorological Data Needed by Engineers," by R. E. Horton, *Engineering News Record*, March 27, 1919, pp. 614–616; reprinted in *Monthly Weather Review*, May, 1919, Vol. 47, pp. 305–307.

[2] See "The Measurement of Rainfall and Snow," by R. E. Horton, *Jour. New England Water Works Assoc.*, 1919, Vol. 33, pp. 14–71, 21 figs., 12 tables; reviewed in *Monthly Weather Rev.*, May, 1919, Vol. 47, pp. 294–296.

[3] September, 1919, Vol. 47, pp. 603–623, 17 figs.